PLANT NUTRIENTS - A PRACTICAL LOOK AT FERTILIZER APPLICATION

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This topic was submitted to present how plant nutrients are physically handled in getting the last ways to their ultimate destination. I want to show some of the problems in handling the volumes of materials required and to show the challenges facing those on the front line; supplying plant nutrients to the end user - the farmer.

The fertilizer industry, agricultural departments, extension workers are promoting the use of greater amounts of nutrients and better ways of application for greater efficiencies so that high yield crops can be grown.

How do these greater volumes of nutrients get from the fertilizer plants to farmers fields. there must be a contact person locally, between the seller and the buyer and that is the fertilizer dealer.

Dealers come in great variety; they can be elevator agents, machinery dealers, bulk fuel agents, hardware store managers, farmer dealers or people who sell nothing but fertilizer.

How do farmers learn about the proper use of their inputs such as fertilizer. They can go to short courses, read magazines and newspapers, or consult with their Agricultural Representative. But when it comes to the final crunch of laying theeir money on the line, the majority will ask the advise of the person who they are buying from.

As previosly mentioned, dealers come with a wide range of backgrounds and educations; some may be Agronomists and some will have very little formal education. Some give out good advise and some give out poor advise; and I do not imply that it is only those with little formal education who give out bad advise.

Dealers must rely on someone for information. I have seen on a number of occasions over the last few years where information has come out through publications, magazines, articles and research data to dealers and farmers from both Industry sources and Government sources, that was

good information, but when taken by itself was very misleading or was very slanted in the direction the source wished it to be. Those in a position of influence who give out this information have a real responsibility; a professional responsibility, to tell the whole story to people such as dealers. They must remember this is the information that is being given to the farmers and not all the people giving this information out have the ability to sift through the chaff and come out with the grain. The majority of dealers give the best advice they possibly can but they must be given the proper information of which to pass on.

One method of gaining information is through the use of a soil test. Once the results have come from a soils lab the dealer and farmer can study the available nutrients in the soil and the lab recommendations. They do not however always go by the soil labs recommendations. There are many other factors that must be considered:

- what is the farmers labor situation.
- can he handle large volumes of seed placed nutrients or will he broadcast his soil requirements.
- is his machinery adequate or is he pressed to get the work done.
- does he have his own fertilizer application equipment or will he need to rent or have it custom applied.
- what is the management ability re: continuous cropping, handling large volumes of fertilizer, handling the amounts of straw and grain resulting.
- will he neglect proper spraying or other cultural practices.
- can the farmer afford the extra costs involved in maximum production; is he a good money manager.

The dealer must consider these factors and more. He is responsible for helpingmaximize the farmers PROFITS. He needs that farmer as a repeat customer so he must supply the proper package.

After studying the soil tests and the farmers practices they decide on how much of each nutrient to apply. The controlling factor on how to apply the nutrients is decided by the methods available, usually from the dealer. The dealer is the one who must decide which route to run his business along.

It is impossible to fully cover all of the methods available for nutrient application here, but I would like to show the many different routes there are to go and that each route has its own problems involved.

What are the options? Basically, fertilizers can be applied as a liquid, a gas or as dry fertilizer.

Liquid fertilizers are those such as 10-34-0, 28-0-0 or 12-0-0-26. Most often these are broadcast with a floater but they can also be seed placed. They are applied alone

or in combination with each other or with chemicals. Another form of liquids are suspensions where floaters play a big role in the application of the four basic nutrients and micro-nutrients. Suspensions can also be shanked in as bands through double or triple shooting. To make any of these systems work efficiently tendering becomes a big factor-hauling the product to the field.

Anhydrous ammonia is applied to the field as a Gas and as such requires special pressure vessels to contain the product. Special anhydrous applicators are used to apply the product as well as variations on these machines such as cultivator kits which pull a tank and wagon behind and cold flo kits, an alternative to applying ammonia only as a gas. A person can double or triple shoot liquids or drys along with the application of ammonia. If a dealer is in the ammonia business and is considering switching to double shooting with liquids he is faced with changing from $15000 ammonia applicators to $40000 double shooters as well as changing over the nurse trucks and supplying storage for liquids also.

In the past most of the nutrients have been applied as Dry Fertilizer. Initial rates were low and easily put on through the drill attachment. As rates increased so did the methods of application. Dribble spreaders were introduced and are still used. Today there are many different types of air seeders used as well as the very common spin spreaders, either tractor pulled or truck mounted custom units. Any analysis can be applied as a dry form as well as mixing some chemicals with the dry fertilizer. As was mentioned previously in order to get efficiency from either farmer pulled or custom units they must be tendered or hauled to.

Once a dealer has progressed past a shed with good shingles and bags he is looking at a sizeable investment in whatever line he chooses. Now it would take one hundred thousand dollars for a basic start and when a reasonable volume has been built up a half million could be invested in buildings and equipment very easily.

When a direction has been chosen they must look at how to get the product to the farmer; what are the logistics involved.

Transportation: Looking at an anhydrous operation,one applicator with a 1000 US gallon tank when putting on 70 pounds of nitrogen will last about two hours. It will require four to six fills per day depending on moving time. One three ton nurse truck will normally keep two applicators

filled and not have much time to spare. These two machines will cover around 550 acres in a day. In an average operation of three nurse trucks they will haul from the storage tank between 55 and 75 tons per day or 3 to 4 semi loads. If these semi's haul from Brandon or Fort Saskatchewan to north east Saskatchewan it would take 4 semi's working around the clock to keep those three nurse trucks going. To haul from Calgary would take 7 semi's to accomplish this.

When looking at moving Dry Fertilizer, one floater doing custom work can cover about 600 acres per day on the average. The capacity of that machine is about 13000 # of material and when applying at 170# per acre it would be empty after 75 acres or one hour. A full days work would apply over 50 tons of fertilizer, or two semi's per day. On a similar haul as mentioned for ammonia it would take a minimum of 4 semi's hauling steady to keep that one floater working.

If you look at liquid fertilizers, they are generally lower in analysis than dry fertilizers or anhydrous so their transportation requirements are that much greater.

As you may have guessed by now there just is not enough transportation around to move all the product in season when needed. In order to alleviate this problem there must be enough STORAGE available to carry you through.

Liquid fertilizers, being lower in analysis, require considerable amounts of storage depending of course on the distance between the plant and the farmers fields. A common sized 25000 gallon tank will store enough nitrogen as 28-0-0 for 1200 acres at 70 lbs. of N, this would keep a floater operating for one anda half days. The same size tank filled with 12-0-0-26 Ammonium Thiosulphate would keep a floater going for 4 days applying 25 lbs. of sulphur.

In the last few years there has been a great many Anhydrous Ammonia storage tanks appearing across the prairies, most of these are 30,000 U.S. gallon capacity. In an average operation with 3 trucks hauling they would empty that tank in one day, so the transportation aspect is still very crucial. The reason there are not 2 or 3 tanks at each storage site is the cost of the tanks, about $60,000.00 for each one.

In the mid 1960's in order to promote the use of Dry Bulk Fertilizer the major fertilizer companies began building their own respective retail buildings. Co-op and Imperial Oil went for a flat plant or horizontal building. The capacity of these plants was in the area of 300 to 400 tons. Cominco built a vertical or upright plant with

capacity of 450 tons. All of these plants work well up to a volume of 2000 to 3000 tons per year. When the capability of these plants was pushed dealerships had to revert to having extra rail cars full of fertilizer on hand and usually run up a considerable demurrage bill or build temporary storage such as grain bins. In the last two years there has been quite an expansion in dry fertilizer storage at the dealer level, most of the buildings being wood quonset style with a number of bins inside to store different products. The fertilizer is loaded in with belt conveyors and legs and loaded out with some form of front end loader into a scale and/or blender and then into the customers truck.

I feel though that the best storage place the majority of times is the FARMERS FIELD , preferably being put there in the fall. As a result of storing nutrients in this manner there is no problem of loss from spoilage when stored in a bin over winter, the new metal hopper bottom bin doesn't get rusty, the job of seeding in spring can be done more efficiently and the customer knows he has the nutrients; because some who wait to do it all in spring have to do without. One of the most important reasons for fall application though is economic. Below I will show the percentage change in price of 46-0-0 from fall to spring over the last three years.

Table 1. Price Changes of Nitrogen Fertilizer 46-0-0.

	% change fall to spring
1980-81	24%
1979-80	27%
1978-79	21%

A price saving of 20 to 25 percent will usually more than offset any loss in efficiency by fall application.

In conclusion, with more dealership storage, to ensure several days supply on hand; with a good ordering system; with transportation operating full tilt and with even greater amounts being fall applied- ever increasing amounts of plant nutrients WILL be applied in the years ahead.

I hope this presentation will enable the reader to see the great number of possibilities and options available and some of the problems and challenges facing todays dealer to keep up.